Additional Details on Longhorn's Proposed SCADA System

Description

The Williams Energy Refined Products Control Center located in Tulsa, Oklahoma will operate the Longhorn Pipeline. The pipeline SCADA system uses Teledyne Brown Engineering Control Application's VECTOR product, version 4.02, on an OpenVMS DEC Alpha 2100a platform. Another identical system located in a remote data center is used as a hot back up. The data of the on-line CPU is shadowed to the back up CPU continuously. Periodic switches between CPUs are performed to ensure system integrity and during maintenance. Each CPU has redundant power supplies and a disk array that will recover from a hard drive crash. Both are covered by 24-hour vendor maintenance contracts, and tape back-ups are performed nightly.

The platforms used for the display system that the Controllers use are DELL OptiPlex GXpro 200MHz personal computers (PCs) running Windows NT 4.0 operating system. Each of the three consoles has two of these PCs with five 19" monitors, three on one PC and two on the other. The SCADA screens in the consoles, used to run the pipelines, are refreshed at five-second intervals by the SCADA server. Other PCs in the Control Center area, used for support and development, are available as spares to the three consoles.

The SCADA servers, Control Center PCs, and other peripheral and communication devices are networked together via two redundant fiber optic 100Mbit-network backbones. Cisco 1900C Ethernet switches are used to distribute the network traffic to the individual devices. Both network backbones have traffic distributed across them, but either has the capacity individually to distribute all traffic. Each of these network backbones is isolated from the Williams Enterprise network, but accessible to the Williams Enterprise network.

The primary communications link to the field sensors for SCADA data is via remote satellite access. The service provider is NovaNet, with their HUB located in Denver, Colorado. The HUB is linked to the Tulsa Control Center by a high-speed data line. The current satellite equipment at the HUB and field sites is NEC Skystar 200. SCADA back-up communications at each field site is provided by a dedicated dial-up land telephone line in the event the satellite system fails or is affected by weather.

Control of field sensors is accomplished with a GE Fanuc 90-70 remote terminal unit (RTU) which is driven by a programmable logic controller (PLC). It gathers all the instrumentation and status of a field sensor and then transmits to the Tulsa Control Center on a five second interval. The RTU also handles any commands sent from the Tulsa Control Center.

The RTU is connected to the satellite system for primary communications and to a modem for back-up communications.

All SCADA and RTU equipment at the Tulsa Control Center and field sites has a battery back-up power supply.

The SCADA data is received from the field RTU at five-second intervals. The SCADA system processes any tank, status, or accumulator data if there's been a change from previous scan. Analog data is processed if it has changed more than one engineering unit from the previous scan. The SCADA system sets high and low threshold parameters automatically on pressure and flow data when a pipeline is in a steady state. Each field site has safety devices built into station/unit controllers that will automatically shut down units in the event of failures or critical alarms. The Tulsa Control Center will ~~ge~~t receive these state changes within five seconds, and the Controller will take corrective action for the entire pipeline system. The Tulsa SCADA system could be configured to take corrective action automatically, but the Tulsa Control Center leaves this to the Controller's discretion.

A very small leak that doesn't propagate a pressure profile or affect flow rates would not be detected by the SCADA system or by the Controller if it did not deviate more than ½% on meter reading. The Tulsa Control Center is evaluating implementation of a Rate Of Change feature which already exists within the VECTOR system that would help detect small pressure changes. Computation Leak Detection modeling also is being evaluated.

UTSI International Corporation April 9, 1999 report entitled Theoretical Leak Detection Performance Evaluation, transmitted to Radian on April 22, 1999.